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The History of Life in Nebraska

A Time-Travel Adventure

By Paul Johnsgard

Wispy blue skies are timeless but, in their present form, Nebraska's Sandhills are only 10,000 years old.

It is difficult for humans, whose lives are measured in years and decades, to fathom the age of the Earth, whose history is patiently but inexorably written on thin pages of landscape, each lasting millions of years or more. As an exercise in Earth-time, let a single mile represent a million years. Thus .5 mile would represent 500,000 years, .10 mile equals 100,000 years, .01 mile (52 feet) equals 10,000 years; .001 mile (5.2 feet) equals 1,000 years, and about 6 inches equal 100 years. A decade would equal about half an inch.

It is 450 miles from the 60th Street on-ramp on Interstate 80 in downtown Omaha to the westernmost I-80 exit at the Wyoming border, which may be thought of as equal to 450 million years. This period of nearly half a billion years encompasses most of the time that evidence of animal life has been found on Earth, but Earth itself is more than 4 billion years old, or ten

times older than the time scale described here, and the earliest known algal fossils are 3.8 billion years old. To start at the approximate age of the planet Earth, we would have to travel about 4,500 miles, rather than 450 miles, to get a sense of the time involved (see drawing on page 26). The age of the universe is perhaps three or four times greater, or more than half the distance around the globe at Nebraska's latitude, at the rate of 1 mile per 1 million years.

Once a Great Seabed

As we join I-80 in Omaha, some 450 million years ago, we are in the middle of the Paleozoic era, the "era of ancient life." Then we would need a boat, as Nebraska was actually submerged under a great inland sea, and the animals present would be mostly corals, sponges, and mollusks, plus a few primitive fishes, such as sharks.

Evidence of animal life comparable to these early types can be found in limestone outcrops such as those near Weeping Water, not far south of Omaha in southeastern Nebraska.

In traveling the 50 miles to Lincoln, we cover 50 million years of late Ordovician and Silurian times, to 400 million years ago, and are entering the Devonian period, and the warm waters of the Paleozoic sea still surround us. We must drive (or boat) all the way to Kearney, some 270 million years ago, before the last remnants of this great sea have retreated and left us on dry land. To reach the start of the age of dinosaurs, the Mesozoic era (the era of "middle animal life"), which began some 220 million years ago, we must get to Cozad, traversing both the Carboniferous and Permian periods in the process. From there to Ogallala, a distance that includes the Triassic and Jurassic periods and encompasses the



MICHAEL FORBES

peak of the dinosaurian reign, there is no clear geologic record in Nebraska. However, abundant dinosaur fossils occur in the Mesozoic deposits of eastern Wyoming and western South Dakota and tell us much of what is now known of these beasts.

Flying Reptiles

These regions were probably then mostly warm, moist bottomlands and evergreen forests of primitive trees and ferns, with an abundance of plant life and other animals. Crouching among all these large beasts were the first mammals, small and timid creatures that perhaps lived on insects and such small reptiles as they could easily capture or on the eggs and young of larger species. Also, early birds were starting to share the skies with flying reptiles. Even these rather primitive birds had larger brains and more

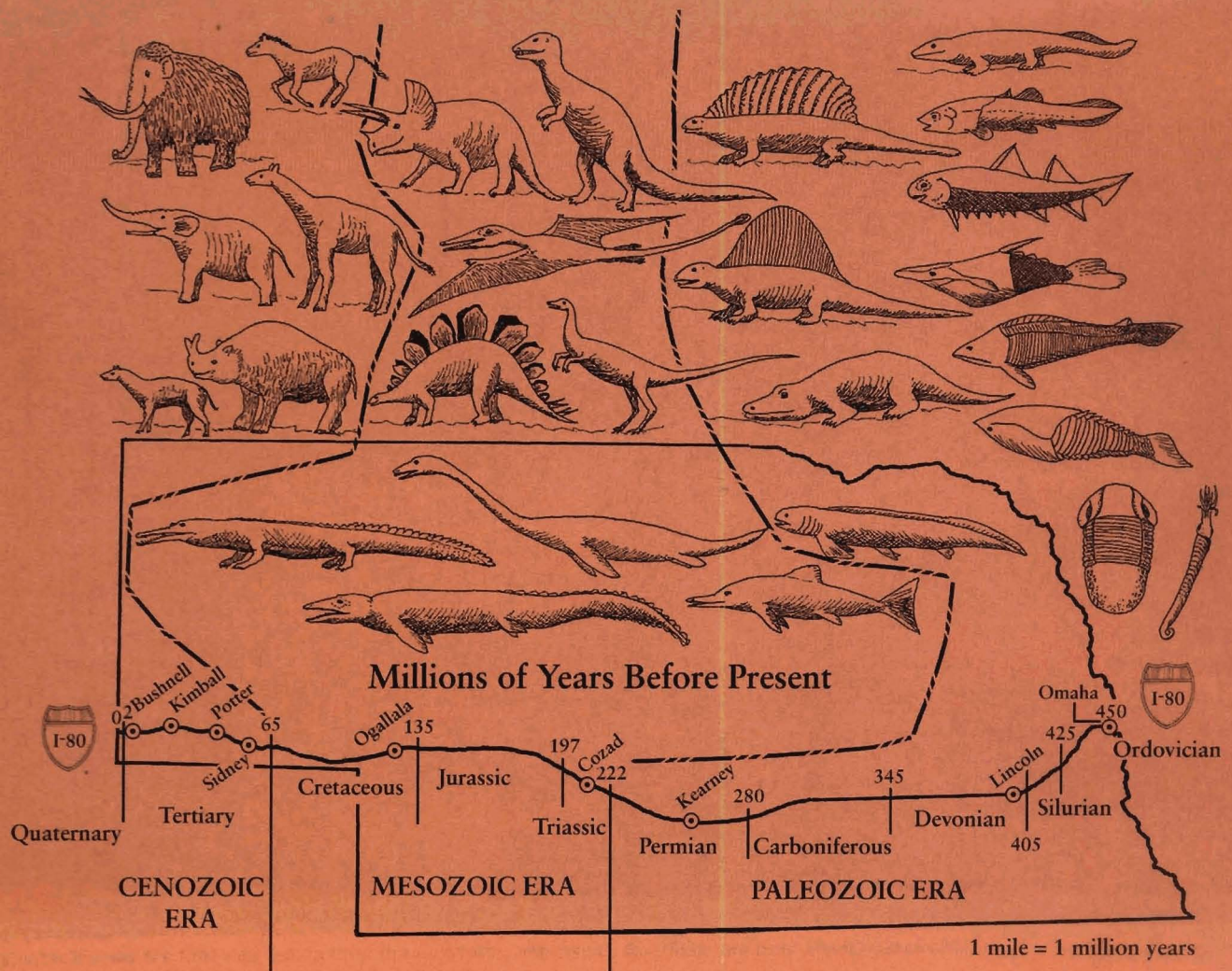
advanced wing structures than the pterosaurs, which were doomed to extinction at the end of the Mesozoic.

The third and last segment of the Mesozoic, the Cretaceous period, is approximately represented by the 65-mile distance from Ogallala to Sidney. It was a time when Nebraska was again covered by shallow seas, with long-necked plesiosaurs swimming swiftly through the waters in search of fish and sometimes rivaling the largest dinosaurs in size. There were also carnivorous mosasaurs, sea-going lizards with large crushing jaws, killing and eating large sharks and bony fishes. A few large but flightless loonlike birds swam along the ocean's shorelines, also in search of fish, and some smaller ternlike ones hovered about its surface. Even then the mammals and birds were still relatively inconspicuous and of little ecological significance in the overall

ecology of Mesozoic life.

All of this life came to a crashing halt about 65 million years ago. The scenario is still being debated, but many scientists believe that the curtain was brought down on the Mesozoic era with the arrival of a huge asteroid that entered the Earth's atmosphere and struck the Caribbean Sea, immediately or eventually killing much of the Earth's terrestrial and aquatic life and altering the climate permanently.

Even such giant marine animals as the plesiosaurs, mosasaurs, ichthyosaurs, and the largest marine turtles met their end, as did many marine invertebrates such as mollusks and mollusklike brachiopods. Warmwater marine phytoplankton that depended on calcium supplies for forming their shells also disappeared, as did many other calcium-dependent marine groups. It was not only the end of an era but also the end of the entire Mesozoic



The geological history of Nebraska, with the time scale represented as a million years for each mile along I-80. Representative extinct animals of the three major geologic eras are depicted in east-to-west (older to newer) sequence. Animals of a single geologic era are generally arranged vertically from older to newer forms, with a few exceptions. Not all of these North American fossil types are known from Nebraska.

lifestyle, both on land and at sea.

Thus, near Sidney, about 65 miles from the Wyoming border, we have just entered the Cenozoic era, the age of "modern animal life," also called the Age of Mammals. Over this 65-million-year period what is now Nebraska was covered sequentially (over millions of years) by tropical forests, then savanna-like mixtures of trees and grasses, and finally true grasslands, an interval called the Tertiary period. This progressive drying of Nebraska's climate was largely the result of the rising of the Rocky Mountains to the west, which shut down the supply of moisture-rich air masses from the Pacific Ocean and produced a much drier climate with

greater seasonal temperature variations. Great elephant-sized titanotheres lumbered across the uplands of Nebraska nearly 40 million years ago, or near Potter on our I-80 time scale. Many other browsing and grazing mammals were present, with grassland-adapted forms progressively replacing the forest-adapted browsers as the woods and forests slowly gave way to prairies. These grazing mammals include camels, rhino, horses, and many others.

It isn't until we reach Kimball, about 20 million years ago, that Nebraska began to resemble the grassy plains we know today. At that time grazing animals such as horses, rhino, camels, grass-eating rodents, and wolflike dogs were

common, and by 17 million years ago the earliest true cats had appeared. The first elephants arrived from Asia 14 million years ago; these were largely browsing mastodons and four-tusked. These species would be replaced later by more modern varieties of elephants that were better adapted for grazing.

Ash Catches Animals

About 10 million years ago, or near Bushnell on our I-80 time scale, vast volcanic clouds of dust settled on Nebraska, gradually choking herds of horses, camels, and rhino and providing the skeletal framework for what is now the Ashfall Fossil Beds State Historical

Park in northeastern Nebraska. Birds such as cranes similar to Africa's present-day crowned cranes were also caught in this cataclysmic event. Yet elsewhere in western Nebraska, ancestral sandhill cranes were already gathering and clamoring each spring, probably along the edges of the similarly ancestral river that would ultimately become Nebraska's lifeblood, the Platte.

A little more than 2 million years ago, or just 2 miles from the end of our road, an enormous, continentwide glacier swept slowly southward out of Canada, bringing with it a variety of arctic-adapted mammals. This was the first of many long glacial periods, which were separated by interglacial periods of similar lengths. Only two of these glaciers actually brought ice as far south as eastern Nebraska, but one glacial lobe even reached northeastern Kansas. These glaciers deposited great beds of potential soils in the form of glacial till, scraped off from lands much farther north. They also occasionally and randomly left enormous boulders, called glacial "erratics," that they had carried south from Minnesota or the Dakotas.

During the rather dry interglacial periods, strong winds stirred up the vast beds of sand, silt, and clay that had eroded off the highlands of Colorado and Wyoming and that had previously been carried to western Nebraska by meltwater rivers from the High Plains and Rocky Mountains. Thus were formed the Nebraska Sandhills. The finer, silty materials were similarly worked by the winds and were carried varying distances to the south and east, mostly accumulating south of the Platte and reaching eastward to Iowa and perhaps even beyond.

The first humans, the antecedents of Native Americans, probably reached North America about 12,000 years ago, or about 75 feet from the end of our trip. This was near the end of the last glaciation, when there was still a relatively dry Bering Sea causeway connecting Alaska with the great Asian landmass. However, remnants of the glaciers in the central Great Plains were then melting and forming enormous but temporary lakes, such as Lake Agassiz

in the Minnesota-North Dakota border region, and in other locations farther north in Canada. Probably caribou, musk oxen, and other arctic-adapted mammals followed the slowly retreating ice sheets northward, feeding on the tundralike grassy vegetation at their edges. By then there were already two kinds of bison on the plains of Nebraska. One was a very large species with massive horns that became extinct about 11,000 years ago, when the last mammoths also disappeared from America. The other bison was smaller and the direct ancestor of the modern bison, which would become the keystone species for survival of Native Americans on the High Plains for nearly a millennium. We have now reached the last major milepost of time, the start of the Holocene epoch, during which humankind would come to control the destiny of the planet.

Brief Euroamerican Era

America wasn't discovered by Europeans until about five centuries ago, or about 3 feet from the end of our road. Nebraska was mostly settled by Europeans little more than a century ago, or about 6 inches from the last turnoff. Also, by about then the passenger pigeon became extinct, as did the Carolina parakeet, both of which were well known to the Native Americans who had lived in eastern Nebraska. The last Eskimo curlew to be shot in America, and one of the last ever to be seen alive anywhere, was killed in Nebraska about 90 years ago. The gray wolf, elk, pronghorn, bighorn sheep, and free-ranging herds of bison were also gone from Nebraska by then, as were the last free-living Native Americans.

The people who are alive today, and the interstate highway on which we have mentally traveled, represent only a few inches of the Earth's total history, based on our 450-million-year scale between Omaha and the Wyoming border. A single year, which sometimes seems endless to us humans, corresponds with about the thickness of the steel on the last Nebraska I-80 exit sign as we end our imaginary trip. ■

The Nature of Nebraska



This broad-winged hawk in threat display is part of an illustration by Paul Johnsgard.

This article – a sweeping view of life in what is now Nebraska – is from the first chapter of Paul Johnsgard's new book, *The Nature of Nebraska: Ecology and Biodiversity*.

An internationally known ornithologist, Johnsgard retired this year from the University of Nebraska-Lincoln.

This wide-ranging, 402-page natural history outlines Nebraska ecosystems and explains the geology and biology that make each distinct. From the state's varied flora and fauna, Johnsgard introduces scores of wildlife and plant species – ranging from the burying beetle to little bluestem – with crisp descriptions and 56 handsome pen-and-ink illustrations.

It also includes checklists of the state's plants and animals and a guide to Nebraska's natural areas and preserves.

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